INSTITUTE OF ENVIRONMENT AND WATER

IEW

EAWLS

IDRC CRDI

# Addressing Sanitation Challenge in Poor Urban Areas through Sustainable Technologies, Gender Integration and Supportive Policy Framework
# Project No. 105250

# Final Report

**Period:** (15th October 2008 – 15th, April 2012)

**Presented to:** International Development Research Centre (IDRC)

**Date of Submission:** August, 2012

**By:** East Africa Wildlife Society/Institute of Environment and Water (IEW)


**Researchers:**

Team Leader – Annabell Waititu

Sanitation: Priscilla Kagure, Grace Orishaba, Vincent Miano, David Kabugo, David Kuria, Daniel Mwesige-NETWAS Uganda

Architect: Ronald Omyonga, NETWAS Uganda

Sanitation Policy Analyst: Dauda Batega, Josiah Omotto, Florence Mbora

Gender: Doris Kakuru, Makerere University; Joke Muylwijk- Gender and Water Alliance; Grace Orishaba, NETWAS Uganda; Annabell Waititu, IEW.

Social Economist: John Njoka, NETWAS UG

Mobilization: Purity Wangombe, Grace Orishaba NETWAS.

| | |
|---|---|
| 1846 | ענתה צפרה אמרה לעמה |
| 1923 | צפרה רעב מצרים מה אמרה מה אמרה נתה |
| 1942 | צפרה נתנה בלבלה |
| 1943 | קבוצה קבוצה |
| 1944 | קצרה, חיפושית, נשפה |
| 1945 | קצרה, חיפושית, נשפה |
| 1946 | אינפורמציה, נתה |
| 1947 | קצרה, חיפושית, נשפה |
| 1948 | מחלה, קצרה, נתה |
| 1949 | מחלה, קצרה, נתה |
| 1950 | מחלה, קצרה, נתה |
| 1951 | מחלה, קצרה, נתה |
| 1952 | מחלה, קצרה, נתה |
|

## Table of Contents

## 1. Introduction

Around 1.1 billion people globally do not have access to improved water supply sources whereas 2.6 billion people do not have access to any type of improved sanitation facility (WHO).[1] About 2 million people die every year due to diarrhea diseases, most of them are children less than 5 years of age. The most affected are the populations in developing countries, living in extreme conditions of poverty, normally peri-urban dwellers or rural inhabitants. Among the main problems which are responsible for this situation are: lack of priority given to the sector, lack of financial resources, lack of sustainability of water supply and sanitation services, poor hygiene behaviours, and inadequate sanitation in public places including hospitals, health centres and schools. Providing access to sufficient quantities of safe water, the provision of facilities for a sanitary disposal of excreta, and introducing sound hygiene behaviours are of capital importance to reduce the burden of disease caused by these risk factors.[2]

Poor sanitation costs Kenya 27 billion Kenyan Shillings each year, equivalent to US$324 million, according to a desk study carried out by the Water and Sanitation Program. This sum is the equivalent of US$8 per person in Kenya per year or 0.9% of the national GDP. 21 million Kenyans use unsanitary or shared latrines. 5.6 million have no latrine at all and defecate in the open. The poorest quintile is 270 times more likely to practice open defection than the richest. Open defecation costs Kenya US$88 million per year – yet eliminating the practice would require less than 1.2 million latrines to be built and used.[3] The sanitation coverage in urban areas of Uganda is about 70% (MWE, 2007). Masaka municipality benefits from the services of the National Water and Sewerage Corporation (NWSC). However, According to the Masaka Municipal Development Plan 2007/08-2009/10, only 24% use water-borne toilets, while 75% use pit latrines, and 1% has no facility at all.

**Sanitation coverage in Kenya and Uganda[4]**

| Access to sanitation | Kenya | Uganda |
|---|---|---|
| **Improved** | **31** | **48** |
| **unimproved** | **29** | **16** |
| **Shared** | **25** | **26** |
| **Open defecation** | **15** | **10** |

***World Bank, 2010.***

In 2008 the East African Wildlife Society (EAWLS) and the Institute of Environment and Water (IEW) proposed a participatory research project to the IDRC as a contribution to the global initiative of providing 2.6 billion people with proper sanitation. *The project commenced on the*15th *of* October 2008. In Kenya, the project was to be part of the integrated effort on Water and Sanitation for the Urban Poor initiative (WSUP) being implemented in Naivasha Municipality while in Uganda, it was to be part of the integrated effort of UN-HABITAT under Lake Victoria Water And Sanitation (WATSAN) initiative in Masaka municipality. The project was supposed to provide gender and technical case scenarios in order to inform their programme designs and implementation on a continuous basis. The project aim was to: study the situation of sanitation infrastructure in these towns, identify alternative sanitation

[1] [1] WHO/UNICEF.(2006). Meeting the MDG drinking water and sanitation target: The urban and the rural challenge of the decade
[2] International Water Association (IWA): sanitation and waste water management
[3] World Bank. 2010.Economic Impacts of poor Sanitation in Africa
[4] *Ibid*

technologies being used in different poverty strata[5], and assess gender needs and concerns in sanitation delivery and the relevance of national and local sanitation policies. This culminated in the modeling of the experiences and options that would in turn lead to testing and applying alternative designs, technologies and delivery mechanisms. Lessons learnt from the tested models were used to inform the ongoing policy reforms in the two countries. It is expected that the findings will continue to shape the work of the development agencies by incorporating lessons learnt from the process.

### *1.1 Overall Objective of the Research:*

The overall of objective of the research was to support development of a delivery mechanism for gender responsive water and sanitation services and appropriate regulatory frameworks for the urban poor in East Africa (Kenya and Uganda).

Specific Objectives:

- ✓ To assess sanitation technologies from the perspective of gender, climatic conditions, hydrogeology and appropriateness with the view to accelerating improved access to water and sanitation particularly for the urban poor.
- ✓ To establish baseline information on gender and vulnerability and identify concerns & needs, in policies and programs with a view to improving equity in access to water and sanitation particularly for the urban poor.
- ✓ To build on lessons learnt, design and test appropriate & sustainable sanitation options for household, communities, schools and institutions for demonstration and going to scale.
- ✓ To synthesize lessons learnt from research and pilots into strategies to improve implementation of the existing WATSAN policy frameworks and program particularly for the urban poor.

### *1.2 Key issues to be addressed by the research were:*

- Identifying challenges faced by the urban poor in accessing water and sanitation services while approaching this from a gender perspective,
- Assessing the state of WATSAN infrastructure and its ability to withstand environmental challenges such as heavy rains and geological formations.
- Identifying the impact of poor sanitation on the urban poor and the general environment.
- Assessing and integrating gender needs and considerations into the choice of sanitation infrastructure.
- Identifying Sanitation policy gaps at the national and local council levels.

Noting that sanitation is not limited to human waste disposal alone, the research adopted an integrated approach to ensure that issues of *water, health, hygiene* and *environmental sanitation* were well analyzed in order to come up with comprehensive solutions that could be piloted in diverse locations. The research team undertook a desk study in collaboration with local stakeholders. A detailed situational analysis in the two towns was also undertaken to establish the actual situation and identify in Masaka municipality the gaps. Informed with this, the team through an intensive consultative process

[5] In an urban settlement population is divided into various clusters based on income levels.

undertook interviews, focus group discussions, design clinics, community mapping and scenario modeling.

It is hoped that the framework emerging from the research will aid in policy dialogue at local and national levels and that the project will develop knowledge products for sharing locally and globally. The project was implemented by the East African Wildlife Society through the Institute of Environment and Water in collaboration with ECOTACT, Gender and Water Alliance (GWA) NETWAS International Uganda and a team of researchers drawn from various fields. The research project sought to address Sanitation Challenge in poor urban areas through sustainable technologies, gender integration and supportive policy framework. It hopes to support development of a delivery mechanism for gender responsive sanitation services and appropriate regulatory frameworks for the urban poor in East Africa (Kenya and Uganda).

### *1.3 The Research Problem*

**A global crisis**

Sustainable access to water and sanitation in developing countries and Sub-Saharan Africa in particular remains an elusive goal for many people and particularly the urban-poor who live in slum areas. It is estimated that at the end of 2002, 1.1 billion people lacked access to safe drinking water, and 2.6 billion or 40 per cent of the world's population did not have access to a sanitary means of excreta disposal[6]. As a result, each year more than 2.2 million persons in developing countries die from diseases associated with lack of access to safe drinking water, inadequate sanitation and poor hygiene[7]. Sub-Saharan Africa suffers from chronically overburdened water systems that suffer ever increasing stress from fast-growing urban areas. This has resulted to considerable pressure on already limited freshwater resources and major environmental burdens especially for the poorest members of the society.

Women are particularly affected by this situation given the fact that they are traditionally responsible for provision of water and sanitation at the household level. Women and girls loose significant productive time due to the amount of time spent on water collection. They are the ones that bear the burden of having to travel long distances to fetch and carry heavy loads of water. They also bear the burden of care giving as a result of WASH related diseases all of which result in increased household health budget. Women and girls also endure the indignity of defecating openly. It is also evident that inspite of the critical role that women play in the management of water and sanitation, they also remain under-represented in the political decision making process where issues of water and sanitation are discussed and determined. Inadequate or lack of access to water and sanitation perpetuates poverty, gender inequality and poor health. Thus, poverty alleviation strategies must address water and sanitation concerns which if left unchecked undermine development gains made over time. This is why this research endeavors to identify key challenges and facilitate the quest for a solution to improved access to sanitation.

Access to improved sanitation has multiple benefits to humanity including environmental protection, good health and access to clean water. Women's and men's needs and uses for water and sanitation are different and it is important that each ones needs and priorities are integrated at all levels of decision

[6] WHO/UNICEF.(2006). Meeting the MDG drinking water and sanitation target: The urban and the rural challenge of the decade.

[7] 2008 WHO-UNICEF Joint Monitoring Programme

making and into all dimensions of water and sanitation provision if goals of water and sanitation are to be met.

In Africa, coverage of safe water supply is estimated to be 62% of the population, with 47% coverage in rural areas and 85% in urban areas. Access to sanitation has a lower coverage of 60% overall with 45% in rural areas and 84% in urban areas. Currently, only 60% of the total population in Africa has sanitation coverage, with coverage varying from 84% in urban areas to 45% in rural areas. However, the population without adequate access to water and sanitation in Africa is likely to be much higher probably over 50% as most of the water and sanitation infrastructure does not remain functional throughout the period[8]. There has been a slow increase in the proportion of Kenyans having access to safe water from 43.3% in 1994 to 57.1% in 2000. However, only 40% of the population has all year round access to safe water supply. Sanitation coverage was estimated at 45% in 1990 and 46% in 1996[9] and has continuously shown slow and uneven expansion. [10]

The findings of a national baseline survey in 2002 clearly showed the inadequacy of water and sanitation in the country as only 5% had flushable toilets, 13% indicated they had no access to any form of sanitation, only 9% had access to water via a tap and 32% were getting water from a river or dam and only 1% indicated refuse was being collected by the local authority[11]. In Mirera-Karagita, Naivasha town, Kenya, where the research project was carried out, access to sanitation is as low as 20%.[12] Naivasha itself is faced with key water and sanitation challenges given that the town depends solely on ground water. Although Lake Naivasha is a fresh water lake, it is not very accessible to the community due to the huge flower farms that surround it. The lake water is also highly polluted from agricultural chemicals and human waste from the town.

### *1.4 Project Location*

The participatory research project was conducted both in Kenya and Uganda. The research results were tested in Mirera-Karagita in Naivasha, Kenya and Masaka in Uganda.

Mirera-Karagita is situated 6km from the centre of Naivasha Town, next to the internationally renowned Lake Naivasha, a designated Ramsar Site. The community is large and fast growing with a current estimated total population of 54,000 people distributed in two major blocks: Karagita, a densely populated slum with a population of 27,000 people; and Mirera, also with 27,000 people, that surrounds Karagita and is more sparsely populated. The area continues to be built up and using conservative growth rates the population is expected to grow to almost 100,000 people by 2017 and to 173,000 people by 2027.

Masaka Municipality is found in the central region of Uganda about 130 kms south west of the national capital-Kampala city along the Trans-African highway to Rwanda and Democratic Republic of Congo (DRC). The Municipality lies at longitude 31o 42' East and latitude 300, 24 South at the heart of Masaka district. Administratively, Masaka Municipality is divided into three divisions; Central (Katwe Buutego), Nyendo-Ssenyange and Kimanaya-Kyabakuza. Each division has two wards. There are 54 villages/cell in the municipality occupying a total land area of about 42.3 sq.kms. By 2002 census the municipality had 67,768 persons with a total of 17,786 households and an average household size of 4 persons. Nyendo

[8] Carter 2004 and Harvey et al. '2004, supports this arguments and casts doubts over the above UN figures.
[9] 2005 Sept UNICEF Environmental Sanitation –Field Update
[10] WHO. http://www.who.int/water_sanitation_health/monitoring/Glassessment6.pdf
[11] Kenya the state of the nation –national baseline survey 2002
[12] The discussions with the WSUP team revealed that there are very few toilets in Mirera-Karagita and from their estimates access to sanitation is in most cases absent and may be as low as 20%.

Ssenyange division had; 29,562 person in 2002 census of whom 13,879 were males and 15,683 were females; with an estimated growth rate of 2.68% the population of Nyendo-Ssenyange by 2007 was projected to be 33,590. There are about 49 ethnic groups living in Masaka Municipality with the Baganda constituting the majority (80%) followed by the Banyankore, Bakiga and Banyarwanda. [13]

### *1.5 Methodology*

The action research which was participatory, adopted an integrated approach that considered the role of technology social, gender, economic and policy issues in accelerating provision of sanitation in the target towns. Each Objective had specific methodology relevant to the activities. The different methods included personal/household interviews, Focus Group Discussions, observations, and national/regional workshops, GIS mapping, water quality testing, soil analysis and review of existing literature among others.

The empirical research was conducted in the two East African towns of Naivasha, in Kenya and Nyendo, Masaka in Uganda during the year 2009. The research method was developed over a period of time and is premised on a participatory process grounded in the collective involvement and knowledge of the stakeholders in the sector. It was (methodology) crafted and agreed upon by a team of researchers in the project who regularly reviewed it during a joint methodology workshop that brought together the consultants from the two countries involved; and stakeholder workshops convened at national levels to introduce the project and review the methodology. It is during the stakeholder workshops that the research methodology and plan was firmed and specific locations agreed upon. The methodology was comprehensive and inclusive.

The initial part of the research project focused on establishing the situational analysis of sanitation in terms of access, gender responsive, environmental sustainability and existing policy frameworks for addressing sanitation from these perspectives. This was done through analysis of existing documents. For the purposes of this report, it is an analysis of the documented information.

Comprehensive data collection was undertaken to provide the situation analysis through the following methods; - Interviews: at household, institutional and community levels using questionnaires and guided Focused Group Discussions. - Observations and - Transect walks - community mapping exercises. The sampling method chosen was based on a variety of statistical and practical factors. This was to ensure the sample size is sufficient for the purpose of the analysis intended and at the same time, ensure that the sample is representative of the population. The practical factors considered in the sampling design were geographical location and respective population sizes.

Apart from literature review, the methodology was also quantitative and qualitative using semi-structured questionnaires that were administered among key institutions, households and community groups (focused group discussions) with community members. A total of 998 respondents were interviewed, 586 in Naivasha and 412 in Nyendo – Masaka. In addition, the project also used existing literature and direct observation of the sanitation and water situation to augment data. The study method included technical evaluation of different sanitation technologies, GIS mapping to determine water and sanitation coverage in the area.

Environmental Impact Assessment (EIA) in Mirera-Karagita Peri-Urban areas in Naivasha Town was conducted in compliance with the Kenyan National Environment Management Authority (NEMA) requirements. The following methodological steps were agreed upon;

[13] Masaka Municipal Council: Municipal Council Profile 2007.

## 2 The Research Findings

*Objective 1: To assess sanitation technologies from the perspective of gender, climatic conditions, hydrogeology and appropriateness with the view to accelerating improved access to water and sanitation particularly for the urban poor.*

An integrated approach to achieving this objective was adopted and it included analysis of technologies in use, gathering information and knowledge on the prevailing hydro-geologic and ecological conditions and their significance in relation to the provision of sustainable sanitation infrastructure in the project sites. The tools used included desk reviews/secondary data review, GIS mapping, observational checklists; and structured questionnaires. The outputs included production of sanitation GIS maps showing the current WATSAN status in Naivasha and a literature review on soil and water analysis. Through collection and analysis of available records of existing boreholes in the project areas and country soil maps, soil and hydro-geological conditions were assessed.

Review of ecologically appropriate and gender responsive sanitation options was done with the aim of finding solutions for improving and modifying future interventions according to the hydro-geological, economic and social feasibility. This was done during the piloting stages of the project at three levels - household, community and school.

### *2.1 Review of existing Sanitation Technology Options in Kenya and Uganda*

Naivasha and Masaka project areas are not sewered and have inadequate water supply. The most commonly used types of sanitation in the target locations remain mainly traditional pit latrines (majority) and improved pit latrines such as VIP toilets. In Masaka, a new pattern is emerging with the UNHABITAT's introduction of low cost sewer system namely small bore sewers. Small bore sewers are said to be completely independent and self-contained system that are not dependent on availability of municipal sewers.[14]

Different methodologies were used to determine the different types of sanitation technologies in the target locations. This was done through literature review of existing studies, household interviews that were conducted at the start of the research project and later GIS mapping.

#### 2.1.1 Types of Sanitation facilities

The data collected during the interviews revealed that the following types of sanitation facilities are in use.

| Type of toilet | Kenya | Uganda |
|---|---|---|
| Pit latrine without slab | 19 | 63 |
| Pit latrine with slab | 46 | 24 |
| VIP | 33 | 10 |
| Water borne | 1 | 3 |

[14] UNHABITAT, 2007. Low Cost Sewer System Concept.

| | | |
|---|---|---|
| Other (neighbour, bucket, flying, etc) | | |

The research revealed poor and inadequate sanitation in the target settlements. 63% and 19% of residents in Masaka and Mirera-Karagita respectively, use pit latrines with no slabs (unimproved sanitation). Only 33% and 10% in Mirera-karagita and Msaka respectively use improved sanitation facilities. It was also observed that there were some plots where there were no sanitation facilities and this would mean that some people are using flying toilets (open defecation) although they were shy to reveal this.

**Relevant quotes**

Women prefer pit latrines to flush toilets because of the water challenge "It is easy to dispose sanitary towels in pit latrines, they do not require water. Some people have flush toilets but they don't use them because they don't have water" *Smartex women group.*

"The latrines are mostly filled up and landlords do not bother to get them evacuated even when we call them" *Kamere Water Project members.*

In Masaka, The women said that they have limited access to choices of facilities and emphasized that the only choice they have is a pit latrine. The existing pit latrines are in poor condition and most of them endanger the lives of young children due to big drop holes, the disabled find it hard to access and some have no doors for shelter/ privacy .

"The landlords have the responsibility of managing the toilets. When they are full the landlords should evacuate them but they don't care. Sometimes it takes even up to three months before they can get them evacuated. The plots become smelly and uninhabitable forcing some people to leave. Landlords should be forced to ensure that toilets are adequate and clean". *Lake Naivasha Disabled Environment Group.*

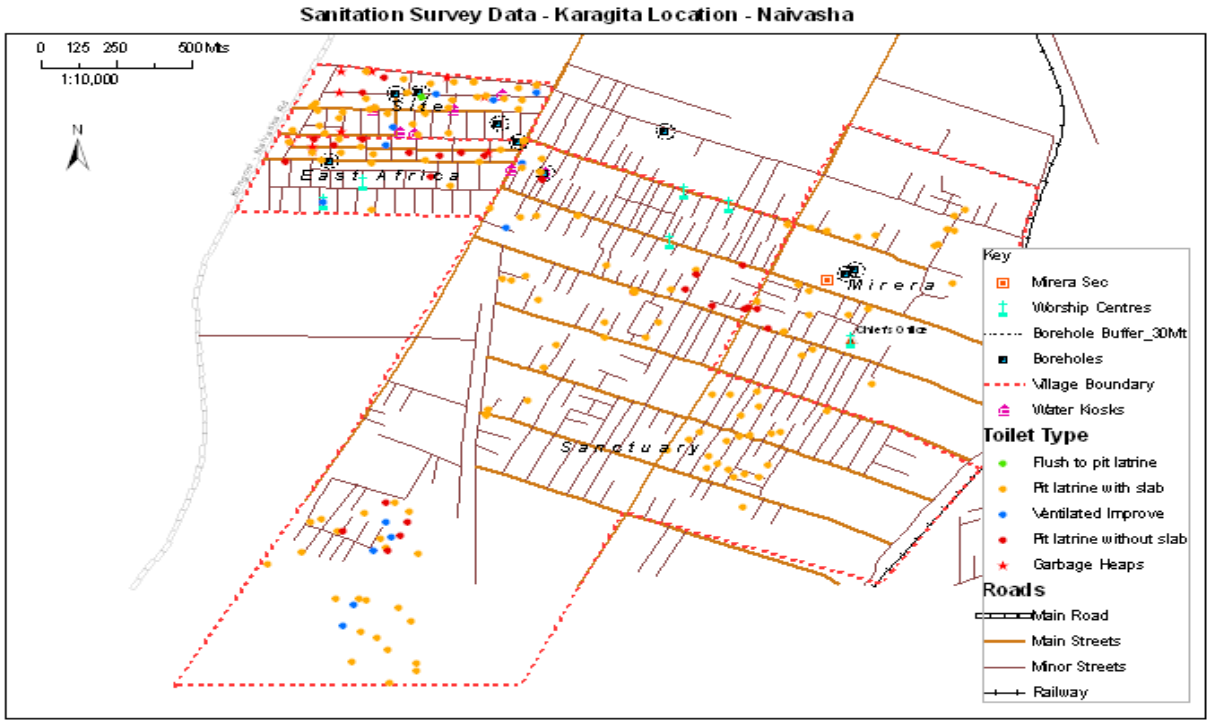
### 2.1.2 Inadequate Sanitation facilities in the target areas

To gauge the different water and sanitation technologies being utilized in the study area, a GIS mapping was initiated. The mapping process targeted 11 villages in Nyendo namely, Binyonyi A & B, Kayirikiti, Mukudde, Kasana, Kitaka, Nakayiba Kitovu Road, Kinsadde, Kasana Kitovu, Ssenyange A & B and four areas of Karagita Location which are: · Site area · Karagita East Africa area and Sanctuary area.

In Nyendo, NETWAS obtained and updated data from UN habitat on GIS done for Lake Victoria WATSAN Initiative. GIS mapping was also completed to establish the status of water and sanitation services in Nyendo/Ssenyange Division. The mapping process targeted 8 zones of Nyendo and 3 zones of Ssenyange Divisions. The mapping helped capture information on water and sanitation on all water supply and sanitation infrastructure; existing water supply, pumps, pumping mains, storage facilities, distribution lines, water delivery points; drainages, individual toilets, community toilets, latrine technology in use, places of solid and liquid waste disposal. Mapping of institutions in the project area that included churches and schools among others was also conducted.

## Sanitation GIS Maps for Mirera Karagita

To ascertain the spatial spread of the various sanitation service technologies being utilized in the study area of Mirera-Karagita, GIS mapping was employed. This started by the acquisition of an aerial imagery of the Mirera-Karagita area.



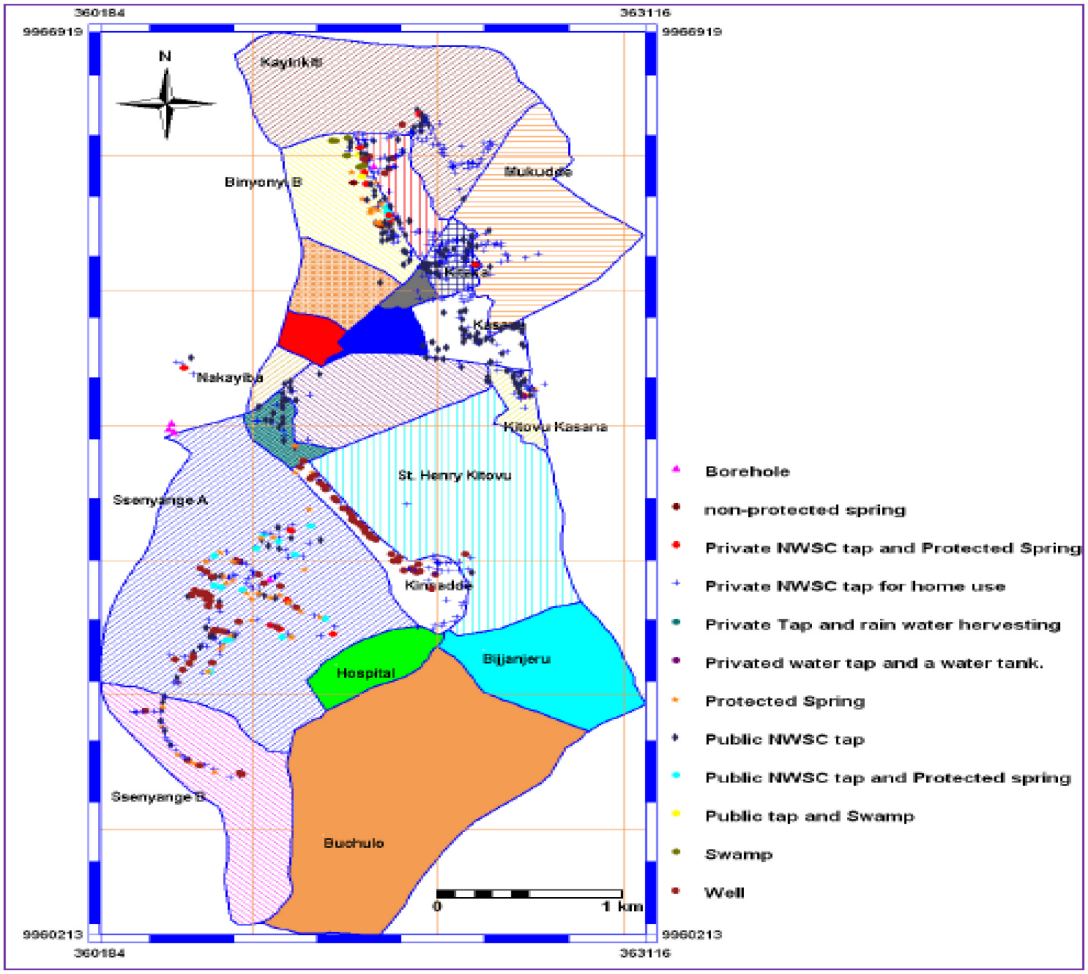

The principal source of water in Mirera-Karagita is groundwater. Several boreholes were located within the study area.

**GIS Maps for Nyendo**

a) Water Supply

Water for household use in Nyendo/Ssenyange division is obtained from the National Water and sewage corporation (NWSC), springs, wells, boreholes, swamp and rainfall harvesting. The main source of water in Nyendo/Ssenyange division is the NWSC, where most residents (78%) are serviced either privately (49%) at their homes or procure water from a NWSC point (29%), which could be a private vendor or a public water source. The proportion of residents using piped water in Nyendo/Ssenyange is higher than the mean proportion (73%) for Masaka municipality. The proportion of residents privately served with water on their premises shows an improving trend.

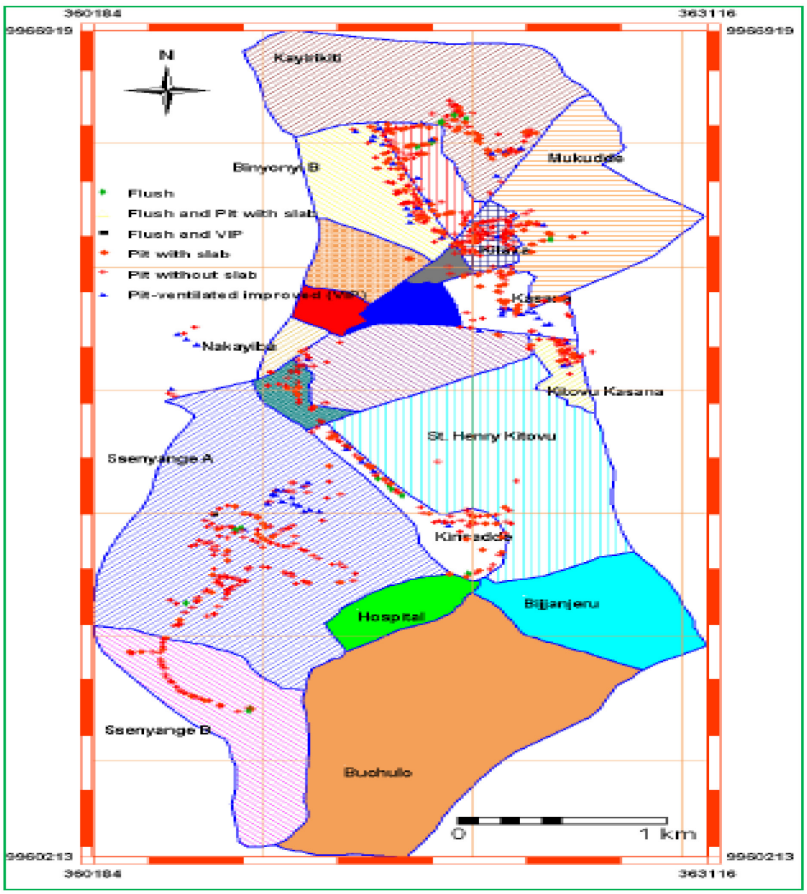
**Positions of different water sources/ facilities in Nyendo/Ssenyange division**




According to the UN-Habitat (2010), 24% of the households have water on their premises, while 66% have water in less than a kilometre. Ideally, water obtained from NWSC should be relatively safer and of good quality in comparison to other sources.

b) Sanitation

**Spatial distribution of toilet types in the villages of Nyendo/Ssenyange division**




**Toilet conditions and toilet hygiene**

Mapping reveals no conspicuous spatial pattern pertaining to the toilet conditions in Nyendo/Ssenyage division. However, Kayirikiti village seems to be outstanding of the villages with the highest number of toilets, which are fairly perceived to be in good conditions. On the other hand, Kitovu and Kasana reported a poor or average rating of the toilet conditions.

### 2.1.3 Inappropriate designs to meet the needs of various categories of people

The research findings revealed that the target project areas have to some extent a good number of people with vulnerabilities. In both Naivasha and Masaka, there are vulnerable persons within most of the households particularly young children (cited by 55.7% in Naivasha and 47.6% in Masaka). Other vulnerable persons include the elderly, people with disabilities, people living with HIV and AIDS, the sickly and those with spinal problems. The vulnerabilities cited here may imply specific technology designs to cater for children, the elderly and the ill.

### 2.1.4 Types of houses and ownership in relation to the type of sanitation facilities

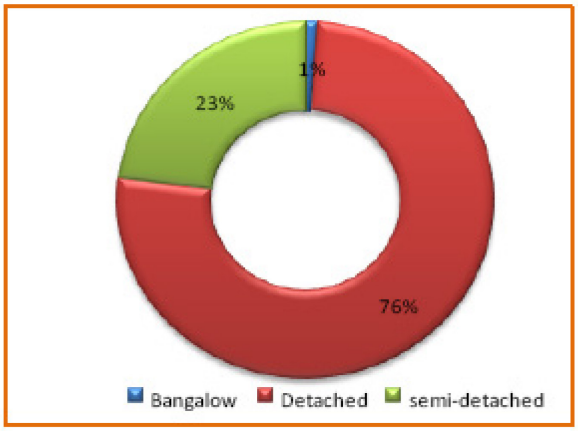
| Tenure Type | N | % | N | % |
|---|---|---|---|---|

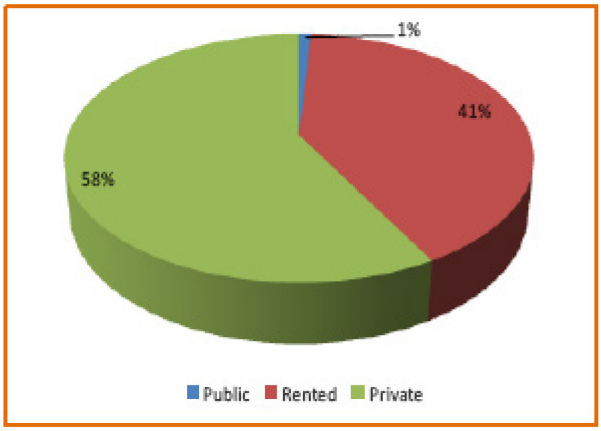
| | Naivasha | | Nyendo | |
|---|---|---|---|---|
| Not an owner (N/A) | 443 | 75.6 | 168 | 40.8 |
| Leasehold | 4 | 0.7 | | |
| Freehold / Mailoland | 139 | 23.7 | 225 | 54.6 |
| Total | 586 | 100.0 | | |

In Naivasha, Most people live in plots and only 24% of the residents own the plots they live, over 75% live in rented houses. The mapping shows that most houses (76%) in Nyendo/Ssenyange division however are detached houses. A small proportion of houses (1%) however, were bungalows. In terms of ownership, the largest proportion (55%) of the interviewed respondents were staying in privately owned houses, while 41% are tenants. Only 1% of the respondents are staying in public houses.

From the study it emerged that in houses with owner occupier, sanitation facilities were better compared to the rented houses and only tenants resided.

**Types of houses and ownership in Nyendo**




### 2.1.5 Factors affecting the integrity of Water - Quality Analysis

The principal source of water in Mirera-Karagita is groundwater. Water supply is from boreholes, owned by private individuals, institutions or by community water user groups. There are practically no networked water services (only 2% are connected by poorly designed pipe networks). The water quality at source (mainly borehole) is poor due to extremely high levels of fluoride (far above the recommended WHO standard of 1.5mg/l.) and then there is the risk that it suffers further contamination due to the inefficient and unhygienic modes of transport.

There are a few households that are connected to the poor piped scheme from the community boreholes. The Photo shows a poor piping system using PVC pipes (electric conduits joint using polythene papers) running in a wastewater drainage channel, which could lead to contamination of the water in the pipes

In addition, the conditions found in Karagita do not fulfill the recommendations given for coexistence of onsite sanitation and use of ground water for domestic purposes, which indicate that there should be an adequate lateral separation between the pit latrine and the borehole to reduce chances of fecal contamination of the ground water. The distance between the boreholes and the pit latrines was estimated to be generally short with some of the boreholes and the nearby pit latrines estimated to be at a distance of less than 30m from each other. In fact, the distance between one borehole and a pit latrine was approximately 13.5m. This raises the risk of contamination of the water sources as coli forms and nutrients could migrate from the pit latrines to the boreholes.

Water samples were taken from 7 selected boreholes within the Karagita area and taken for laboratory analysis at KIRDI (Kenya Industrial Research and Development Institute). The water analysis showed that three out of the seven boreholes sampled tested positive for total coliforms. However, there was no direct relationship of latrine proximity to borehole location. This means that unlined toilet pits did not contaminate ground water sources.

In Ssenyange, laboratory tests were carried to determine the levels and types of water contamination in 5 different sites. This analysis was done during the dry season. The quality of surface water from most of the sources is questionable, especially during the wet season when the floods carry huge loads of different forms of waste through the open drainage channels into the open surface water sources. The social mapping for water quality conducted by the researchers in Uganda shows a habit of using hanging latrines. This is evidence of possible *E.coli* contamination in the affected sources. However, because the analysis was done during the dry season, the results did not show high levels of Ecoli. The results of the analysis are attached herein (Appendix 6)

**A water source in Site 5 (Ssenyange) in Masaka.**

### 2.1.6 Hydro-geological and ecological conditions of the study area

**Mirera-Karagita:** The study area is dominated by two types of quatenary deposits, one of which is lacustrine and the other of volcanic origin. On the basis of surface outcrops, the main products of volcanism within the Olkaria Volcanic Complex (termed the Olkaria Volcanic Group) are alkali rhyolite (comendite) lava and pyroclastic rocks. Trachyte and basalt-hawaiite lava have been minor products, but widespread trachytic pyroclastics are believed to have been erupted from vents within the complex[15] . Pyroclastic-ashes, agglomerates and tuffs make up a considerable proportion in the area, but mostly low depths of the area.

The soils are generally collapsible and affect sustainability of sanitation facilities. Although not significantly, there have been reports of toilets collapsing.

**Masaka:** the prevailing hydrogeological and ecological conditions and their significance in relation to the provision of sustainable sanitation infrastructure in the project sites.

Among the key issues highlighted include,

- The terrain in several areas especially around poor urban neighbourhood settlements close to wetlands and mountainous areas (e.g. rocky or soft soils, high water table etc) determines the choice of sanitation technologies.
- Many of the policies and strategies that have been developed in Uganda WASH sector do not fully address the hydrogeological or ecological issues such as the difficult soil conditions or reusable pits.

[15] Clarke et al., 1990

### 2.1.7 Climatic Conditions affecting sanitation facilities

Both Naivasha and Masaka experience flooding during the rainy seasonal. Floods affect the sanitation infrastructure and results to collapse of the facilities which are already at risk given hydro-geological conditions. Naivasha also experiences heavy winds that have implications on sanitation facilities. For example, a visit to Mirera secondary school revealed that heavy wind experienced carries and deposits debris, dust and leaves into the urinals thereby blocking them.

### 2.1.8 Assessment of local capacities for WATSAN management

A major setback to realizing sanitation goals is the lack of knowledge on how to construct and maintain pit latrines to the hydro-geological conditions of the project areas. This factor has led to poor quality construction, basic design faults and unsafe pits. Capacity assessments conducted for the local masons and artisans revealed low capacity to adapt sanitation facilities to the local conditions and gender needs and concerns. The challenge for integration of gender and social issues was not only a challenge among the local masons and artisans but also within the responsible institutions and actors.

The technology designs need to be adapted to these needs to ensure access by all categories of people living in the target areas. This can only be achieved if the local capacities are built to address the identified gaps.

Information received from UN HABITAT and from WSUP on their gender mainstreaming assessments revealed that there was dire need for training and awareness creation on the subject.

a) At the school levels, it emerged during the assessment both in Masaka and Naivasha that there was low capacity for responding to gender needs and concerns in sanitation development, managing sanitation facilities as well as low knowledge of the provisions of school sanitation policy.
b) At the community level, management of sanitation technologies and WASH as a whole was a challenge. Facilities are poorly managed, and hygiene fails to meet the expected standards. Other capacity issues were located in the technical areas relating to construction of facilities that respond to gender needs and climatic conditions of the areas.

## *2.2 Socio-economic and gender issues in water and sanitation*

Objective 2: To Establish the gender and vulnerability concerns and needs on the ground, in policies and programs with a view to improving equity in access to water and sanitation particularly for the urban poor.

Towards this objective, baseline information was collected on the socio-economic situation and gender and vulnerability concerns were identified. The goal was to ensure that future programmes, interventions and policies can be shaped by the actual needs and concerns of the user groups. Information collected, if used, will assist sector players to develop effective and appropriate interventions at all levels. The information was collected using questionnaires, key informant interviews and gender mappings or focused group discussions.

The following assessments were undertaken;

- Socio-economic characteristics of the target community
- Socio-economic and environmental opportunity costs related to existing WATSAN services. ·
- Knowledge and Perceptions regarding WATSAN services in relation to identifying gender needs and requirements.

### 2.3 Socio-Economic Characteristics of the Respondents[16]

#### a) Sex of the respondents

Majority of the respondents were females (68.3% in Naivasha and 70.6% in Nyendo), which is explained by the equally high population of females in the two locations coupled by the presence of flower farms in Naivasha, that attracts mostly female labour. As the main health seekers and providers for their households, this finding is significant in that females are more likely to cooperate in a sanitation technology improvement project.

#### b) Education status

In terms of education, most respondents have basic (primary and secondary) education (Table 12). Masaka respondents have a relatively higher proportion of respondents (16.3%) with college education. Coupled with the youthful feature, this impressive educational attainment for both research areas imply an ability to productively engage the residents on sanitation issues and technology choice options with relative ease as they can easily consume behavior change materials and be sensitized using different languages and approaches.

**Table 1 Level of Education of Respodents**

| Level of Education | Naivasha | | Masaka | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| | | | | |
| None | 31 | 5.3 | 33 | 8.0 |
| Primary | 271 | 46.2 | 134 | 32.5 |
| Secondary | 255 | 43.5 | 169 | 41.0 |
| College | 27 | 4.6 | 67 | 16.3 |
| University | 2 | 0.3 | 9 | 2.2 |
| Total | 586 | 100.0 | 412 | 100.0 |

#### c) Respondents' incomes

The incomes of the respondents are at the low level, e.g. a mean income of Kshs.115,620 (US$1,635) per year (Kshs.9,635 or US$135 per month) and a modal income of US$1,000 (Kshs. 72,000) in Naivasha. The figures are more or less similar for Masaka at Kshs.208,847 per year and a mode of Kshs equivalent of 73,052. The mean expenditures collaborate this income status, e.g. Kshs.114,412 per year in Masaka. The table below shows that most of the respondents were either in salaried employment or in business. Given the peri-urban nature of the two places, and more so Naivasha, a substantial proportion of the population is also engaged in farming.

**Respondents' occupations**

| Main occupation | Naivasha | | Masaka | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |

[16] Research data collected from the field at the beginning of the project.

| | | | | |
|---|---|---|---|---|
| Farming | 179 | 30.5 | 36 | 8.7 |
| Salaried employment | 279 | 47.6 | 54 | 13.1 |
| Business | 82 | 14.0 | 163 | 39.6 |
| Casual labour | 41 | 7.0 | 22 | 5.3 |
| None | 5 | 0.9 | 115 | 27.9 |
| Student | 0 | 0 | 2 | 5 |
| Other | 0 | 0 | 20 | 4.9 |
| Total | 586 | 100.0 | 412 | 100.0 |

**d) Expenditure patterns on water and sanitation**

Water costs per day are high as evidenced by amounts the resident pay for water, i.e., Ksh. 26.5 (0.37 of US$1) in Naivasha, which translates to Kshs.795 per month or 8.3% of the monthly household income way above the recommended limit of 3 percent of a household income.[17] This is a high expenditure given that there are other needs for education, health care and livelihoods of the household members. Sanitation is not paid for as only 3.4% pay for it in Masaka. No one pays for use of the sanitary facility in Naivasha.

**e) Willingness and ability to pay for water and sanitation**

Most respondents are unwilling to pay for sanitation on both MK and Nyendo. Given that most respondents in Naivasha (75.8%) and a substantial (40.8%) in Nyendo rent their dwellings, this implies that residents have very little or no say whatsoever on the type of sanitation facilities they use. Studies by UN HABITAT show that land ownership and tenure system determinant types of installation of water and sanitation facilities.

***The 2005 women statement delivered to the Chair of the UN Commission on Sustainable Development stated that "Safe land, tenure and property ownership, especially for women, fits into rights-based "human settlement' 'approaches and will stimulate municipalities and individual households to invest in sanitation facilities". UNCSD, statement of the women major group, 2010.***

There is also the case of inability to pay for services. Based on low incomes and high costs of installing sanitation facilities (of approximately USD 300 for a simple latrine), there is a likelihood that many of the residents will find it difficult to spend on the toilet. Another good example is the high evacuation costs of up to ksh. 3000 (USD 25) for a service that is very rare to find both in Mirera Karagita and Nyendo. For most people, they cannot afford to pay such a cost.

In several plots visited, the income generated from house rents was as low 200 per house (poorly constructed mud houses. One landlord although absent was collecting only 2100 from 7 houses. The latrine was in very poor condition. One of the mother in the compound noted that she does not allow her son to use the toilet. Another landlord who collects about one thousand two hundred from 4 houses said he could not afford to construct a toilet.

[17] The 2006 Human Development Report

**2.4 Socio-economic opportunity costs related to existing WATSAN services.**

Poor sanitation costs Africa up to 5% of its GDP[18]. According to WSP, Kenya and Uganda lose billions of shillings to poor sanitation. Kenya loses USD 324 million and Uganda USD 177 million annually which accounts to 0.9% and 1.1% of the national GDP respectively. Open defecation costs Uganda USD$41 million – yet eliminating the practice would require less than 650,000 latrines to be built and used. Open defecation costs Kenya US$88 million per year – yet eliminating the practice would require less than 1.2 million latrines to be built and used.

| millions lost each year | Uganda (million USD) | Kenya (million USD) |
|---|---|---|
| **In Access Time** | **8.1** | **26** |
| **Premature death** | **147** | **244** |
| **Productivity losses while sick or accessing healthcare** | **1.1** | **2.7** |
| **Health care** | **21** | **51** |

***Generated from WSP report on Economic Impacts of poor sanitation in Africa.***

The desk study, Economic Impacts of Poor Sanitation in Africa, found the majority of these costs to production come from annual premature deaths, including children under the age of five, due to diarrheal disease. Nearly 90 percent of these deaths are directly attributable to poor water, sanitation, and hygiene. Other significant costs were productivity losses from poor sanitation, and time lost through the practice of open defecation[19].

WSP also reaffirms that the costs of poor sanitation are inequitably distributed with the highest economic burden falling disproportionately on the poorest.

**a) Information collected from Mirera Public Health Clinic.**

From the clinical surveys undertaken in Mirera Public Health clinic records, data revealed that water, sanitation and hygiene (WASH) related diseases are burdensome to the residents of the Mirera-Karagita. Data recorded between March to August 2010 for both under five and over five years revealed that the top five diseases were WASH related. In July 2010, the record showed that 296 patients out of 365 patients (total number of patients attended during the month) were treated for WASH related diseases as follows; respiratory diseases[20] taking the highest precedence at 32.6% and malaria at 28.4%. On the overall, 81.1% of the clinic attendees under five years suffered WASH related sicknesses. During the same month, among the over five years, 518 patients out of 712 total number of patients attended to at the clinic were also treated for similar sicknesses. Malaria had higher occurrence at 29.8% followed by respiratory diseases at 26.7%. On the overall, 72.2% of the patients suffered from WASH related sicknesses.[21]

[18] AMCOW

19 WSP. (July, 2011). Economic Impacts of Poor Sanitation in Africa

20 WHO considers Gastroenteritis are malaria are key indicators of water-related morbidity and mortality levels

21 Data collected from a clinic in Mirera by the research team

Once again, the burden related to impacts of poor sanitation falls disproportionately on women as caregivers who may spend additional time accompanying young children or sick or elderly relatives. This cost is likely to be an underestimation as those without toilets, particularly women, will be obliged to find a private location for urination as well[22]

### *2.5 Gender issues and concerns in sanitation*

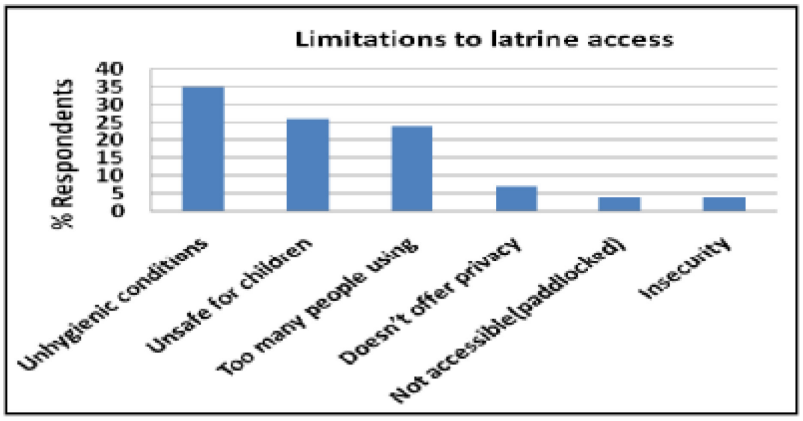
Lack of basic sanitation and safe water is an acute problem for the women and girls who live in poor and overcrowded urban slums. Women in particular face unique challenges because of their biological structure and their roles in water and sanitation. In addition, children and vulnerable groups such as those with physical disabilities and or with illnesses face major challenges of access. Both Nyendo and Masaka had similar challenges – privacy issues, technologies and sharing of sanitation facilities. In Uganda, WASH policies have not addressed the nature of the superstructures, drop-hole size and shape, latrine technology, latrine facilities capacity or washroom needs for girls.

There were similarities in concerns regarding the present conditions of sanitation facilities in Kenya and Uganda study areas. Some of these included;

#### a) Poor hygiene and sharing of sanitation facilities

60% of the respondent population expressed limitations of accessing to sanitation facility citing unhygienic conditions, unsafe for use by children, too many people sharing, lack of privacy, insecurity and locked latrines by landlords. Based on the table below, unhygienic conditions accounted for the largest number of respondents.

**Limitations to Latrine Access**




Sharing of the toilet is also cited as key constraint in the above table. Respondents noted that a facility is shared by too many people. A shared facility has a major implication on access by especially women and girls. It compromises hygiene, privacy, convenience and security of especially women and girls.

[22] ibid

*A household is considered to have adequate sanitation if: it has an excreta disposal system, either in the form of a private toilet or a public toilet and is shared (if public) with a reasonable number of people (maximum of two households). (MDGs, 2000)*

"People with disabilities are most affected by the unhygienic conditions of the sanitation facilities. Many times some of us get into the plot facilities, we come out with our clothes soiled because even supportive mechanisms are not in place and sometimes the facilities are slippery". ***Member of the Lake Naivasha Disabled Environment Group***

Given the fact that facilities in the study area are shared by a large number of people, regular cleaning would be necessary to guarantee a reasonable level of hygiene and hence optimal utilization.

***We are afraid of making demands for toilets incase the landlords decide to increase rent. But on the other hand, when the toilets are full, even if you ask the landlord/lady to get the toilets evacuated, they do not care. Most of the toilets here are full but they can stay like that for a long time before any action can be taken. (Tenant).***

**b) Privacy and dignity**

Where there are no facilities for defecation, this is a grave problem for everyone, men included, but especially for women and children and young girls in particular. Women and girls can be forced to wait until nightfall to defecate, if there are no suitable sanitation facilities for them to use in the daytime. The symptoms of menstruation, pregnancy and the postnatal period become more problematic if women have nowhere to deal with them adequately.[23] Sharing of sanitation facilities is common among the resident of both study sites, e.g. a mean of 8 households per facility in Naivasha translating to as many as 30 persons per facility.[24] For this reason, shared sanitation remains a key concern for women and girls. It is also contributes to unhygienic conditions of the toilets and privacy concerns.

***Many of them have to wait to relieve themselves until dark, sometimes confronting the fear and the reality of harassment and sexual assault***

**c) Security of women and girls**

The location of a sanitation facility if not appropriate can pose a great threat to the security of women and girls. It exposes them to possible attacks by strangers as they try to access and use it. Insecurity does not only deny women and girls' access to sanitation facilities, but also cause them to hold back from relieving themselves for long hours further exposing them to health complications. As exemplified by the case mentioned below, women's workload is added to their already constrained time by the need to supervise and or watch the young girls as they go to the toilet.

**A case of insecurity and indignity**

[23] GWA/ UNICEF. For her it is The Big Issue: Evidence from the
[24] Research data collected from the field.

Mama Wairimu is married and a mother of a 9 year old primary school going daughter. She lives with her husband and child in a plot of 19 households with an average of four persons per household. The plot has only two toilets and two bathrooms that are shared by everyone. Wairimu (daughter) woke up one morning at around 6.30 am to go to the toilet to relieve herself. On reaching the toilet she found a man hiding inside and who I turn tried to strangle and rape her. Fortunately her screams for help were heard and her parents and a few neighbors came to her rescue.

The perpetrator was arrested and thereafter jailed for 6 months. But the incident left Wairimu traumatized. Even after visiting the children welfare department in Naivasha, Wairimu is yet to get adequate counseling. The parents also feel that the sentence was not punitive enough to deter a repeat offence of this kind. They considered it 'a slap on the wrist' compared to the heinous act committed.
Not all are as lucky as Wairimu the cases of rape in Karagita are common, said Mama Wairimu as she narrated the case of yet another assailant who raped a ten year old girl and threw her in to the toilet. As a result of these cases, both parents and children are live in fear. This creates a need for children to be supervised when going to the toilet. Wairimu is still under shock and needs professional counselling to be able to continue with her life normally. The mother noted that this has also affected her school performance and her self esteem.

Asked whether the current facilities are adequate, mama Wairimu noted that she feels the toilets are not enough because sometimes they have to queue in the mornings due to demand. This she noted is very inconveniencing because sometimes you desperately want to use the facility and you cannot. Sharing of facilities with men is also a major issue of concern for her because it denies her privacy and she wished there could be a different facility for women. The husband however, did not mind sharing the toilets with the ladies.

**Men also suffer indignity**

It became evident that when sanitation facilities fill up, most people are not able to afford the cost evacuation. And even when they could afford, some of the locations of the toilets are inaccessible, or the formal evacuators are unwilling to do it for fear of sanitary pads which are likely to spoil their equipments. Many people result to manual evacuation. These are mostly men. Although they offer a necessary service, manual evacuators are disregarded within the society. They suffer the indignity of handling the filth, exposure to health issues, ridicule and rejection.

### d) Inappropriate Technology

In Mirera/Karagita this is a major issue of concern that continues to hinder access to sanitation. In the case of Mariam below, what it means is that if you cannot squat /bend as a woman you may not even use the toilet. In most cases then they have to look for alternatives.

**Unresponsive technologies: Size (measurements) of the sanitation facilities is constraining use**

The poor sanitary conditions in Mirera Karagita continue to hinder access to adequate sanitation. Mariam (not real name) lives in a plot with 9 households. All the 9 houses share a single toilet and a bathroom facility. The facility is constructed with plastic papers and does not guarantee privacy. The bathroom is just next to the toilet and is also made of plastic papers. When the research team visited Mariam, the toilet had been inappropriately used and therefore not accessible. With embarrassment written all over her face, Mariam quickly noted, "it could even be my son, due to the size of the toilet, it is difficult to use the facility appropriately. If you try to bend, you touch the walls making it very inconveniencing and difficult to aim at the hole" said Mariam. She added that one of the residents of the plot is an old sickly man who does not have anyone to look after him except for one young man who visits him once in a while. Miriam could not explain how this man accesses the toilet facility, she only said in a soft voice, but he does not have a choice.

The problem of size is not just at the household level. During a visit to the Rubiri Primary School, it was observed that the toilet facilities are below the standard measurements as provided by the school sanitation policy. The toilets for boy and girls are back to back although the school sanitation and hygiene policy provides that toilets for boy and girls should not be back to back and even provides for a standard distance. But the head teacher noted that they had money to construct only 4 facilities per gender. In their effort to increase the number of facilities, they made a decision to reduce the measurements.

**Case study of gender and vulnerability: Household on-Plot Sanitation facility.**

One of the selected benefactors of the pilot facilities is a lady by the name Agatha Wanjiru. She is an elderly single lady, who lives with two of her grand children. Her daughter, the mother to these children lives in Nairobi and hardly ever visits. Currently, Agatha is an IDP who formally resided in Eldoret. Agatha has a lot of difficulty walking due to sickness which has left her legs swollen and with painful wounds. Due to this, she is forced to use a wheelchair for easy mobility. She presently lives in a small piece of land in Githuri area of Karagita, which was donated to her by a well wisher. The only sanitation facility available is a dilapidated pit latrine made of mud, sticks and polythene paper. The door is made of wood and the toilet has no roof at all! The toilet is used by Agatha and her two, small, grandchildren. Gaining access to the toilet is one of her greatest challenge especially since she uses a wheelchair. Agatha recalls how she once literally fell in the toilet while trying to maneuver her way. There is neither a bathroom nor a hand wash facility in the humble homestead, which forces them to bathe in the bedroom. Agatha was very happy the day construction work on the new toilet and bathroom finally started. She thought this day would never come since many people had previously promised to help her but only took advantage of her and their help never materialized. She told us how in her mind she often pictures the new toilet in a certain corner of her plot. She was especially happy that the dilapidated toilet she uses presently would finally be demolished so that she would not have to see it any more.

**e) Low participation of women and youth in water and sanitation management**

In general, there was very low participation of women and men in water and sanitation activities. Only 6 (3 males and 3 females) respondents confirmed participation in sanitation related activities. Low

participation, particularly of women was noted among the groups interviewed. Kamere water project and Smartex women groups noted that women's participation was limited to cleaning and maintenance. Kamere group noted that "women are not involved in the designing and siting of sanitation facilities, only men and the male youths are allowed". Similar sentiments were echoed by the Smartex women group who said "Women and girls do not participate in planning because men do not involve them. Women issues are not taken into account, men decide what should be installed and the women are left to do the maintenance part". The following matrix provides the views of the Kamere Water Project;

**Table 2 Participation of women's and men's views of Kamere water project**

| Activities | Women | Men | Youth male | Youth female |
|---|---|---|---|---|
| Siting (consultations, information) | | X | | |
| Planning | | X | | |
| Implementation(construction Piping, trenching) | | X | | X |
| Management (plumbing, maintenance, cleaning, mgt committees) | X | | X | |

A discussion with the Lake Naivasha Disabled Environment Group indicated that those living with disabilities are also not adequately involved in water and sanitation designs. They noted that the existing facilities failed to take into consideration the needs of the vulnerable groups. In particular they mentioned that most of these facilities were not hygienic and were also unsafe as they lacked supportive mechanisms. They expressed their concern over continued marginalization that was demonstrated by insensitive sanitation designs and the inadequate consultation with the physically challenged by relevant stakeholders in the area. Technical options must take into consideration the socio-economic needs of the local groups if sanitation goals are to be addressed.

### f) Low participation of women in designing and construction activities

Women lacked technical capacities for participating in the development activities such as construction and maintenance (plumbing, repairs) of sanitation facilities.

**Women in Senyange feel they have a stronger say on type and location of sanitation facilities**

When women in Uganda were asked what they thought the roles of women and men in sanitation and hygiene in Ssenyange were most of them said that they always take the initiative of putting up good sanitation facilities; most men have been negligent to construct latrines. They only put up temporary structures that are not user friendly and fill very first. The women also do the cleaning of these facilities since they are always at home, and if visitors come, they are the one to blame for the filthy. They are responsible for maintaining proper household hygiene other chores like cooking food and fetching water. The men on the other hand acknowledged that, they have the sole responsibility of selecting where the toilet facilities are located, however, women also can decide since most husbands are working and trying to make ends meet. They mentioned that, majority of their women are house wives who stay at home with children.

When women were asked who they thought has power to decide on sanitation technologies and location in the households, **t**hey responded that most women do since most men are not at home to

oversee this activity and as such may not know the urgency. However, a section mentioned that men, as household heads have the power to decide on the location and type of sanitation facility.

### *2.6 Piloting the different options*

*Objective 3: To build on lessons learnt, design and test appropriate & sustainable sanitation options for household, communities, schools and institutions for demonstration and going to scale.*

This section of the report addresses objective three of building on the lessons learnt to design and test appropriate and sustainable options for household, communities, schools and institutions for demonstration and going to scale. By the its very nature therefore, this section is one that applies the lessons learnt in the previous stages in developing design solutions and piloting them and yet still gathering and documenting the lessons that are drawn both from the implementation process and leading to the post implementation period.

Towards realization of the above objective no. 3, various activities have taken place both in Kenya and Uganda. Both countries are at different levels of implementation..
The construction phase was preceded by a number of preparatory activities. The design were prepared based on the findings of the empirical survey, policy analysis, consultations etc based on the following key parameters:

- **Functional issues –** the primary function of a sanitation facility is to provide privacy, comfort and ease of use that ensures dignity of the users. Hygiene is another key function of a proper sanitation facility. This was a running theme in each of the design clinics and is as such a key design parameter. The architect explored different ways of achieving the right design configuration to achieve this set of functional requirements. The designs presented here are the results of that delicate balance.
- **Technical aspects** – these include the existing building materials and technology and the capacity of the local people to implement the different options. Other technical issues considered included technology options for the treatment or storage of waste to reduce health risks. Lack of sewer connection for instance results in increased costs on the substructure to ensure that waste is safely handled.
- **Gender and Socio-cultural issues** – The specific needs of women, men, girls and boys were discussed and considered to ensure the designs cater for their unique needs. The needs of vulnerable groups as people with disabilities were identified since disabled community members participated in these design clinics. The designs have taken into account the varying religious beliefs, in particular the Muslim community which is significant in the project area. This being a cosmopolitan urban area, the issue of culture was not too important and thus did not feature much as a key design parameter.
- **Inclusiveness** – The designs produced being a result of a very intensive participatory design dialogue that brought together representatives from a wide range of community members to ensure gender balance, and consideration of the needs of children and people with disabilities.

- **Environmental issues** – Each option was appraised based on its potential negative environmental effects and that guided design choices and decisions. The key environmental concern is the likely contamination of groundwater sources due to construction of unlined pits. Project studies showed that groundwater depths (>70feet) were not within reach of standard latrine pit depths(30-45feet).Water quality tests of boreholes dug within 15m of pit latrines showed no contamination of total coliforms, which is a widely used indicator of fecal matter contamination.
- **Economic sustainability** – The Karagita community is a Low-Income Urban community. Each design gauged on its cost-effectiveness and long term financial sustainability. The communal facility has to be designed to provide for enterprise activities that will contribute in providing clean and affordable water and sanitation services. Different material types were chosen based on their cost-effectiveness even in the future.
- **Policy and regulatory issues** – Every effort has been made to ensure that developed project designs adhere to the existing regulatory requirements. The Karagita Area PHO was present in all our design clinics to provide this focus. The project acquired Ministry of Education School Designs developed by the Ministry of Public Works, to guide the design of the school latrine facility. Other key regulators, through the Peer review sessions also had a chance to review the designs before they were taken back to the community for feedback.

These factors that had emerged out the findings of objectives 1 and 2 served as the baseline on which design consultations and decisions were made. A reconnaissance visit carried out by the consultant architect also helped lay the ground for design clinics. Sanitation Design clinics were adopted as participatory methodology to engage all the key stakeholders in the design process of the Karagita sanitation facilities pilot projects.

### *2.7 Design Clinic*

These are sanitation design sessions that were attended by women and men representing different interest groups in the community and also in schools. The purpose was to engage the residents in adopting sanitation technologies that meet their needs; easy to use, maintain and repair; and affordable and one that can easily be replicated. From the reviews undertaken and the community processes, a sanitation menu was prepared.

Preliminary designs were used to develop a sanitation menu of appropriate sanitation facilities for the Karagita area. The sanitation menu provides options of various locally available material types that can be used for construction each preferred facility at Plot, School and Communal/public level. The current construction costs which include material and labour costs for each facility type have been determined. The locally available materials for construction of a toilet in Karagita Village are:

- Natural stone(Quarry stones)
- Timber planks and Timber offcuts
- Iron Sheets
- Pumice soil man-made blocks
- Mud/Earth

The menu provides different impressions of preferred sanitation options selected by the communities and their associated costs. This formed an information base for sanitation promotion and improvement in Karagita. The reuse of old or unwanted materials was encouraged as a means of reducing material costs.

In Nyendo, Masaka, the stakeholders were presented with a range of technologies appropriate for the area hydro geological and social conditions.

The following section provides an overview of the design clinics at the community and school levels. In Both Naivasha and Masaka, participation of the local administration and authorities was recorded.

### 2.7.1 Community design clinics

#### a) Naivasha

The community sanitation facility design clinic was attended by Karagita residents (15 men and 7 women) who were representing various groups mainly the Handicapped, Village elders, Local Administration (Area Chief), Municipal Council (Area Councilor), Ministry of Public Health and Sanitation (Area PHO), Local NGO (WSUP), Market traders, Landlords, tenants and religious groups (Muslim and Christian leaders). During this session the participants discussed the sanitation status of the area, learnt different sanitation technologies and provided sketches of a communal sanitation facility. The participants selected the pour flush toilet connected to a septic tank system (for communal). The VIP model was selected since they were familiar with the design and had no known challenges except that when plastics are thrown into the pit, the lifetime of the latrine is reduced since it cannot be exhausted. The full description of this activity is attached with this report as **Appendix 8**.

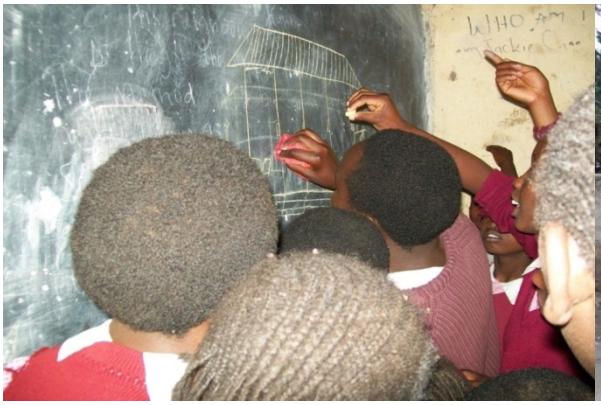
#### b) Nyendo

Design clinics in Uganda aimed at facilitating involvement of local communities' identification of appropriate sanitation designs. In the meetings with different stakeholders at district, NGOs and Division level, the project summary with planned activities was shared and a scenario of proposed appropriate sanitation technologies derived from literature was presented as well as those appropriate to Nyendo Ssenyange context.

Other technology proposals for testing on the ground included UDDT Ecosan at a household level, an aqua-privy toilet in a school and an in depth study as well as intervention to address the O&M issues around public toilets already existing. In a participatory manner, stakeholders supported in proposing some of the probable sites and beneficiaries for both technologies, i.e., the house hold and school level.

### 2.7.2 School Design Clinic

Various schools were visited and assessed in both Naivasha and Nyendo. In Naivasha the schools visited included Longonot, Rubiri, Mirera primary and Mirera secondary Schools; and in Nyendo KY Primary School, Ssenyange Education Center and Nyendo Mixed Secondary School among others. Ssenyange Education Center was finally selected and an aqua privy technology was tested.




*"Boys don't need the doors since they compete when they go to the toilet to see who can aim the toilet hole from the furthest point while urinating," said by one female student in Mirera Primary school.*

### *2.8 Piloting of facilities in Uganda*

In Naivasha, VIP model was selected for household use, and flush toilet connected to a septic tank system for communal use. In Nyendo an Ecosan (UDDT) was select for household and an aqua privy for a school. Female and male artisans were identified and trained on Latrine/toilet construction. Training manuals for the artisans were developed to facilitate this process.

### *2.8.1 Identification of artisans and masons*

Local Masons were identified with the help of local communities. Opportunity was given to both women and men on an equal basis. Using the training manual, the identified masons were given hands on training on installation of relevant technologies and maintenance of facilities under construction. The idea was to ensure that the skills acquired will be used beyond the project and thereby contribute to possible scaling up.

The training focused on equipping the artisans and masons with skills on how to construct the identified technologies. During the training, it ensured that issues of disability and gender are well understood and that the participants are able to integrate the needs of women and men in designs. In Uganda, The training also focused creating awareness of how the ecosan works and why it should be promoted (advantages and disadvantages and operation and maintenance among others). As a result, the training created appreciation of ecosan among the local communities and the municipal and division staff.

"The training has opened our eyes; we should go and transform others to appreciate ecosan as a good sanitation technological option by sharing with them the benefits and advantages it has. A member of Nyendo Division.

In Naivasha, Kenya, a Training Needs Assessment (TNA) of the artisans was conducted. A TNA form was developed to aid the process of collecting the information on the existing technical capacities and gaps. At least 20 artisans were assessed. 40% of those artisans assessed were women.

In Kenya, the female artisans expressed their appreciation of the training and involvement in the construction saying, that this would offer them a good opportunity to diversify livelihoods instead of their high dependence on casual labour in agricultural farms. A lot of awareness was needed to have men appreciate the new entrants into their market.

### *2.8.2 Construction of pilot technologies*

### 2.8.3 Plot-based Sanitation Technologies

#### i) Construction of Ecosan (UDDT)

Ecosan systems are an alternative to conventional sanitation system; it's based on an ecosystem approach that treats urine and feaces as valuable resources that can be recycled after at least 6 months. It's also a drop and store method but storage is only for specific period. In this period the wastes are sanitized and then can be recycled ,this is aimed at destroying pathogens and allowing for formation of composite that can be safely utilized as manure. UDDT is a toilet in which urine is separated from feacal matter; it consists of two processing chambers each with a volume of about 0.3 cubic meters. It is built entirely above ground with the processing chambers placed on a solid floor of concrete, bricks or clay. The floor is built up to at least 10cm above ground so that heavy rains do not flood it. The processing chambers are covered with a squatting slab that has two-drop holes, footrests and a groove for urine. At the back are two openings 30cmx 30cm for the removal of the dehydrated material.

*Masons at work in Nyendo*

***The behind and inside view of the constructed ecosan household level in Nyendo***

Ecosan is more appropriate in areas with spacious land as it requires space for refuse/manure. It is also a perfect solution for areas with high water table because it does contaminate ground water; and also rocky areas where deep excavation for pit latrines is not possible. This is the case in Ssenyange since – rocky with high water table.

**i) VIP toilets**

A wide variety Ventilated Improved Pit (VIP) toilet systems were installed in Karagita using different types of walling materials such as timber, quarry stones, iron sheets and pumice blocks. A sanitation menu of different materials including mud was prepared to provide a wide range of options, depending on the financial capacity of the user.

All of the VIP toilets constructed have a concrete slab with well positioned pit hole and foot rests. The Vent-pipe is located behind toilet and there is an access manhole behind the toilet to facilitate easy waste exhaustion. Each of the four installations has 4 cubicles modular structure, two toilet and two bathrooms, for plots with more than 20 persons. The design provides for option of separating women and men access to facility.

One of the facilities was done for a family with physically challenged persons and was therefore fitted with a raised seat and supportive mechanisms to ensure that such individuals can use the facilities without a problem**.**

***Timberoffcuts made toilet, besides it is what the family used before. A raised seat to enable vulnerable members in the household to use the toilet.***

**Pumice Block material – behind is the previous facility:**

**Iron sheets materials, in front is what was existing before.**

### *2.8.4 School facilities*

#### i) The Aqua Privy Toilet: Tested in school

The conventional aqua privy is essentially a small septic tank located directly below a squatting plate which has a drop pipe extending below the liquid level in the tank to form a simple water seal.

To prevent odor, fly and mosquito nuisance in the toilet, the water seal has to be maintained by adding sufficient water per toilet visit to the tank via the drop-pipe to replace any losses. The excreta are deposited directly into the tank where they are decomposed an aerobically similar to a septic tank. A housing or shed is built over the tank. A vent pipe with a fly screen at the top end is attached to the housing. A water-tight tank is desirable to minimize losses. An effluent (overflow) pipe is installed above the level of the drop-pipe.

An aqua-privy functions in a similar manner to a septic tank whilst avoiding the need for a consistent water supply to operate a flush toilet. The water will drain off the top and the sludge needs to be emptied on a regular basis.

Aqua privy needs people to first appreciate it through extensive marketing, its more suitable for institutional level like schools and need to be implemented in these places first before scaling the technology to household levels.

#### ii) A biogas sanitation facility was designed for Mirera Karagita

This was however not tested in the school but the design is available for use by other stakeholders (the design is attached herein **– attachment 9**). The issue that emerged and which needed more attention is operations and maintenance (O & M). This was done through training of the stakeholders during training workshops – both in Naivasha and Masaka.

### *2.8.5 Community Sanitation facility*

The ablution block contain separate female and male flush toilets, with each side having a facility to serve the physically challenged persons; a bathroom and hand wash basins. The female side is fitted with mirrors, sanitary bins and changing room. The facility is connected to the main network for water and sanitation in the area.

**i) Flush toilet**

**Inside the communal facility;**

**Front side- water kiosk;**

**Entrance to sanitation**

## 3. Strengthening of O&M of existing public sanitation facilities

### a) Masaka

A major challenge in both study areas is the one of poor operations and maintenance of existing sanitation facilities. In Masaka, there are 11 sites that need O & M intervention, among those in bad state were; Lukaaya taxi stage, Nsereko zone, Market triangle, the proposal is to look at these sites, and set up O&M frameworks. The O & M study and capacity building was undertaken to determine the kind of intervention needed. The study was largely informed by the work of a task force set up by the municipal council that comprised of UN Habitat, Town Clerk and other division staff on the management of the facilities.

The assessment revealed a lot of challenges faced in public places which included;

1. Frequent breaking down of taps, too high water bills leading to disconnections by National Water and Sewerage Cooperation among many others.
2. Non existence of Management Structures at community level.
3. Lack of ownership of public toilets resulting to mismanagement.
4. Failure to pay Operation and Maintenance fees by the users and leading to abandonment of the facilities.
5. Unclear Contract management between the private operator and division with unclear terms on roles and responsibilities.

***A public toilet with jerry cans used for flushing and a broken ventilation pipe.***

Towards strengthening the O & M management, training and empowerment of Management committees was implemented in masaka.

### b) Naivasha

In Naivasha on the other hand, poor operations and maintenance was noted at plot/household and school levels. Prior to this project, Mirera did not have any public facilities. The O & M training was

conducted for the stakeholders at all levels jointly by the project team, Water and Sanitation for the Urban Poor (WSUP) and the Public Health Office. The training covered areas of health and hygiene, and general management of the existing and facilities being constructed.

## 4. Stakeholder Results Dissemination Workshops

At the end of the project period, two project stakeholder workshops were held in Kenya and Uganda. The Uganda workshop that took place in Masaka was national in nature although included representatives of the Kenya research team. The regional workshop was in Kenya and brought together stakeholders in both Kenya and Uganda. The purpose of the two workshops was to share key findings, experiences and lessons learnt from the research project.

The workshops brought together relevant government Ministries and institutions; Civil Society (NGOs & CBOs), local leaders and private Sector players. These participants comprised of sector implementers and decision makers.

Regional participants in a working group in Naivasha

During the National stakeholder workshop, NETWAS received a certificate of recognition by the Mayor of Masaka, in honor of their contribution to the water and sanitation sector in the municipality.

During the regional workshops, a number of recommendations were made on how to improve gender responsiveness in sanitation service delivery. Some of the recommendations are for the government to provide incentives for sanitation, empowerment of local communities, Sustainability /O&M for WATSAN projects, the need to pay attention to menstrual hygiene management, the need for multi-sectoral collaboration by Networking with health community level, environmental managers, engineers and sectoral committees to achieve good sanitation and MDGs by 2015, among others. These recommendations are contained in the workshop reports, **attachment 10A & 10B**.

## 5. Lessons learnt

**Objective 4: To synthesize lessons learnt from research and pilots into strategies to improve implementation of the existing WATSAN policy frameworks and program particularly for the urban poor.**

Lessons learnt during the implementation of this project were fed into the policy and planning processes through various policy and practitioners' meetings. Both Kenya and Uganda teams have been able to influence the inter-agency programmes and decisions. In Kenya, the project team participated in public health working groups on water and sanitation and contributed by regularly sharing the research findings. The partnership of the project with key players on the ground such as the Municipal council, Naivasha Water and Sewerage Company (NAIVAWAS), Water and Sanitation for the Urban Poor (WSUP) has grown. This greatly contributed to the success of the project and ownership at the project level.

In Uganda, the research team worked closely with the Ministry of Water and the Municipal Council and the Division staff, UN HABITAT and jointly worked towards improving the sanitation situation in the project area. NETWAS Uganda received recognition of their contribution towards water and sanitation management by the Municipal Council.

During the research results dissemination workshop, the research teams were able to reach out to the decision makers and practitioners. Some of the recommendations made during the workshops, if adopted by the decision makers, will greatly improve delivery of water and sanitation services to the urban poor. It emerges from the research that equitable access to water and sanitation has greatly been hampered by lack of responsive policy/legal frameworks on one hand, and lack of enforcement on the other hand.

A key recommendation is the need for enforcement of and compliance with policies that are existing in order to accelerate access to adequate sanitation.

***Lessons from the ground***

1. Public /communal ablution blocks – research has shown that even as much as there are efforts to enhance access to sanitation facilities, the communal ablution blocks are not being optimally utilized by women. Information collected show that the majority of users of the ablution blocks in the urban settlements are men. Women shy off from using these facilities due to a number of factors – costs and privacy. Cost was said to be the main obstacle (WSP, Field Report). [25]
2. **Poor management of water and sanitation facility is the single most important obstacle to accessing sanitation services -** In both Kenya and Uganda a major problem with the current sanitation facilities is more of poor management than the availability especially when it comes to the public and school sanitation. This calls for the need to pay attention to operations and maintenance.

**Public facilities**
It was observed that most of the public sanitation facilities in Nyendo are, flush toilets and pour flush. Majority of them face O&M challenges. Water to one of the public toilets in the market had been disconnected and users had to get water in a bottle which is a health risk factor. This is in addition to the absence of hand washing facilities in some cases. An obvious omission to all the facilities was the provision of sanitary bins which led to sanitary pads being thrown into the toilet. Another key problem was the process of awarding contracts to manage the facilities that was said to lack transparency. The attitude of the users who still look at public toilets as Government property and responsibility and therefore feel no obligation to pay for their use.

**The public school facility in Nyendo.**

[25] WSP-World Bank training report

There have been investments made in water flush toilets and a water supply system at the primary school. However, the flush toilets are no longer functioning, largely due to their novelty. The children at the school were not accustomed to such facilities and were understandably curious as to how they worked. In an effort to investigate, the children tried to flush stones and papers causing the toilets to break. ***(LVWATSAN Further Inquiry Report, May 2011).***

A community toilet visited was under lock and key because the community members refused to pay user fees and the division office decided to lock it as they improvise alternatives. Unlike in Masaka, Mirera/Karagita does not have public facilities. However, sanitation facilities were found locked in the plots because the landlord was either not present or it was at night and he/she feared inappropriate use.

From this scenario it is clear that Operations and Maintenance of sanitation facilities should be carefully considered at the inception of technologies and the choice of investment should be guided by the practicalities and costs of O& M as it dictates sustainability of the interventions.

3. Land tenure and ownership is a key determinant of the type and quality of facility. Should be constructed and people mainly affected by this are the tenants who are exposed to undignified facilities especially on plots that the owners are absent. Despite their desire of having better facilities they cannot dictate when or where to have a sanitation facility since they do not own land. This makes the separation of facilities for the sickly, elderly and even disabled difficult since they are not permanent in the plots thus challenging. Plot owners are key in the implementation and improvement of on plot sanitation facilities for their tenants and they should be encouraged to embrace the provision of dignified sanitation with close follow up and surveillance from mandated institutions.

4. Land policies and regulations do exist but compliance to the building standards and regulations are rarely followed by plot owners and those investing in sanitation facilities. To solve this the policy makers and regulators should

5. Women are particularly affected by poor sanitation situation given the fact that they are traditionally responsible for provision of water and sanitation at the household level. They are the ones who bear the burden of having to travel long distances to fetch and carry heavy loads of water. They bear the indignity of defecating openly and the burden of care giving as a result of WASH diseases. They also continue to bear disproportionately the related impacts of inadequate sanitation such as care giving to those suffering from WASH diseases. Unfortunately, in spite of the critical role that women play in the management of water and sanitation, they remain also under represented in the political decision making process where issues of water and sanitation are discussed and determined. This scenario has been confirmed from the documented case studies in both locations.

6. Participation of women in construction and decision making structures is influenced by two major factors

a. Women lack the confidence and assurance from their inner self that they are just as capable as the men. To overcome this challenge, women empowerment is important. have to be encouraged and assured that they can just do what the men are doing. Demonstration trainings that involve women are crucial in building the confidence of women and besides serves as an encouragement to other women who then become convinced that they are also capable.

b. Criticisms and discouragements from other people especially fellow men artisans hinder women's participation as they are discouraged with claims of not knowing the job or being very slow thus delaying the construction process. Some of the men are not willing to transfer skills to the women as they fear that they will be snatched their jobs if women got skills. It is important that the women should be continuously be encouraged until their confidence in offering skills and decision making is built.

7. It was observed that when it comes to building and construction of the sanitation facilities, women could do same jobs as men if trained and encouraged. A good example was the molding of building blocks for constructing the facilities.

8. The existence of policies does not automatically translate into adequate sanitation. The inaction or lack of implementation and enforcement by the policy makers to ensure that there is compliance with existing laws is detrimental to service delivery and overall achievement of MDG goals.

9. Partnerships play a major role in enabling effective delivery of sanitation services. Partnership with WSUP, NETWAS and UN HABITAT has contributed a great deal of success to the project. UN HABITAT became a source of useful information and many lessons were derived from that process. Jointly with WSUP, IEW was able to generate new knowledge on gender, water and sanitation. The support from IDRC went beyond donor-recipient relation to include capacity strengthening through advice on many project related aspects. The partnership with all these institutions enabled building and leveraging on the strengths and opportunities of each other.

**The changing face of Water in the project area: WSUP Water and sanitation Project in Mirera Karagita**

In the recent past, WSUP has improved clean water supply and access to sanitation at the household level. The Mirera-Karagita Water and environmental Sanitation programme aimed to reach 100,000 people in the Naivasha area with improved water and sanitation services, together with better hygiene. A model has been tested, where the water services provider, water company and community run new decentralised water treatment plants under an operating agreement, while private and community boreholes provide the water. Fluoride filters, using locally produced bone char, are being used to treat the high level of fluoride in the drinking water sold at kiosks in the programme area.

This has greatly impacted access to safe water. At the time the beginning of the project, water (unsafe with high fluoride) costed Ksh. 10 per 20 litre jerican; by the time the project was coming to an end, the water cost had reduced to Ksh. 2 (treated for fluoride) and Ksh 1 (water for washing –not deflouridated) for the same 20 litre jerican.

## 6. Recommendations and Conclusions

To ensure adequate access to water and sanitation services will require an integrated approach. It takes into consideration the policies, technologies, environmental conditions, people and institutions. It must be noted that while improving sanitation facilities may result to safe water, increasing sanitation coverage coupled with improved water, sanitation and hygiene behavior may result to even greater significant impacts in health improvement. This study suggests the need for provision of improved sanitation facilities that are responsive to user needs, supporting policies and effective institutions in order to achieve sanitation goals. The following recommendations have been made.

1. **Policy and regulation:** There is a growing recognition of the need to give adequate attention to the sanitary conditions in the poor urban areas. The rapid urbanization and growing poverty especially in the poor urban settlement call for attention to the urban poor. However, the policies remain weak in this regard and also in relation to addressing the gender concerns. Improving land and municipal governance including that of water and sanitation would go a long way in addressing the ever growing challenges of access to sanitation. Reviewing the policies to make them more responsive to the local needs and enhancing enforcement would contribute greatly to sanitation development. The sanitation strategies need to be strengthened in order to address gender and vulnerability. It is also important to institutionalize gender within the relevant institutions so that they can adopt a gender approach to policy and programs. Strengthening policy enforcement is also critical to improving the representation/involvement of women and men in decision-making forums regarding water and sanitation as well as the management of sanitation facilities.
2. **Gender analysis:** Promote a gender sensitive analysis of the impact of laws and policies in the sanitation sector.
3. **Gender sensitive budgeting -** programmes and policies should provide budget allocations for addressing gender in sanitation solutions.
4. **Appropriate technology for sanitation:** There is a general lack of appropriate sanitation technologies required to address the needs of the various groups of vulnerable men and women. Adapting technologies to user needs (ensuring it is all encompassing) would go a long way in enhancing access. In addition, considering the social structures of urban users, addressing the needs and concerns of everybody can best be done through the provision of public sanitation structures (without ignoring the responsibility of the landlords to provide sanitation facilities within the plots). It is important to bear in mind the heterogeneous nature of the community as well as their needs.
5. **Improving sanitation coverage and services:** The coverage remains very low and the lack of sanitation services such as evacuation of toilets once they are full. More public facilities should be constructed with the aim of reducing the average distance between the facilities and the furthest households. As noted above, in the target study area, most toilets were full and therefore not usable. The municipal council have the mandate to provide and maintain sanitary

services, sewerage and drainage facilities (Local Government Act). The council should ensure that evacuation services are available to the locals at an affordable cost. There is need to explore how to encourage private sector involvement in this regard or its promotion as a local economic development activity for the local groups.

6. **High costs for installation of facilities should be addressed through pro-poor intervention**: The installations costs of good sanitation facilities was way beyond what is affordable to most people – at least not less than USD300 per unit. Appropriate sanitation technologies should be cost-effective in terms of affordability by the urban poor women and men and vulnerable groups. Exploring use of local materials is necessary so as to reduce cost by a large margin. The project is exploring use of pumice as a local material for constructing sanitation facilities use of local labour and expertise.
7. **Technical capacity** f**or gender mainstreaming:** There is need to build technical and managerial capacity for personnel working in areas where gender prioritization is required to achieve effective water and sanitation service delivery. Creating understanding of what gender is, gender concerns in WATSAN and how to address such concerns is needed for effective implementation of a sanitation programme. There is need for capacity building for the different stakeholders in both the sanitation management and in gender mainstreaming into water and sanitation services delivery.
8. **Implementation of existing policies and commitments:** The governments in east Africa have made commitments to gender mainstreaming at all levels of policy, programme and project development and management. These commitments can be located in national, regional and international policy frameworks. If implemented, there is a huge potential for improving responsiveness to gender and user needs in water and sanitation development. For example, the National Water Services Strategy in Kenya indicates that the water sector intends to develop national standards (technical and managerial) for low-cost technologies to be designed and enforced through the WSTF by the provision of appropriate financial resources and WASREB to be incorporated in tariff negotiations by 2008.
9. **O&M challenges:** There is a major challenge of O&M on already existing public toilets in Masaka and in public schools across the 2 project areas. In the meetings with key stakeholders in Masaka, their interest is to see how this project will contribute to O and M more than putting up new structures in public places.
10. **Capacity building:** Water and sanitation development must be accompanied by adequate training and capacity building that ensures proper management and sustainability of any interventions. It is paramount that O and M is made an integral part of the construction process. There is need for capacity building for the different stakeholders in both the sanitation management and in gender mainstreaming into water and sanitation services delivery.
11. To enhance management of sanitary pads that have become a nuisance, sanitation facilities at all levels –school, household and in the community should be fitted with an incinerator. A good sanitation facility is that which is fitted with hand washing facilities, hygienic and offers security to the women and girls.

12. Poverty remains a single most challenge to accessing and improving quality of sanitation. Some landlords are amongst the poorest in some poor settlements.

## 7. References


1 Central Bureau of Statistics: Economic Survey, p199

2 COHRE, AAAS, SDC and UN-HABITAT (2007). Manual on the Right to Water and Sanitation .

3 Cross & Morel, (2000). Pro-Poor Strategies for Urban Water Supply and Sanitation Services Delivery in Africa

4 DFID (2008) Water: An increasingly precious resource Sanitation: A matter of dignity

5 Letita A. Obeng, Global Water Partnership - Sanitation Abatement in IWRM

*6* Ministry of Education and Sports (2009) Hand book (draft) for Operation and Maintenance of water, sanitation and hygiene facilities in schools in Uganda.

7 MWE (2007) Uganda Water and Sanitation Sector Performance Report 2007

8 MWLE, (2003)... Third Joint Sector Review of the Water and Sanitation Sector, Issue Paper3.

9 SSWARS (2007) Sustainable Toilet Options Catalogue

10 Uganda MoH, 2004

11 UNDP, (2004). Achieving The Millennium Development Goals For Water And Sanitation: What Will It Take? Millennium Project, available online at: www.unmillenniumproject.org

12 UNDP, (2003). United Nations Development Programme (UNDP) Human Development Report

13 UNDP, (2006). United Nations Development Programme (UNDP) Human Development Report

14 UNDP, Mainstreaming Gender, pp.13-14.

15 UN-Habitat (2003). UN-Habitat Global Report On Human Settlement

16 UNICEF (1998) Water, Environment and Sanitation Technical Guidelines Series - No. 5

17 UNIFEM (1996). Energy and environment technology source books; water supply.

18 GWA, UNICEF, et al. Water Sanitation and Hygiene – For her it is The Big Issue: Putting women at the centre of water supply, sanitation and hygiene. Evidence Report

19 GWA & UNDP. (2006). RESOURCE GUIDE. Mainstreaming Gender in Water Management

20 GWA & CAPNET. Why gender matters. A tutorial for water managers.

21 WSP. (2010). Economic impacts of poor sanitation in Africa

22 2008 WHO-UNICEF Joint Monitoring Programme

23 Carter 2004 and Harvey et al. '2004, supports this arguments and casts doubts over the above UN figures.

24 2005 Sept UNICEF Environmental Sanitation –Field Update

25 Kenya the state of the nation –national baseline survey 2002

26 Human Development Report 2006

*Appendix 6: Water Quality Analysis –Nyendo*

05/06/2010

**C/O WASSWA FAC.SOC. SC.**

MOB: 0701119379

**WATER QUALITY MONITORING:MASAKA NYENDO AND SENYANGE.**

| PARAMETER | SITE-1 BINYONYI | SITE- 2 KAIRIKITI | SITE-3 WA JINGO | SITE-4 WA DENIS | SITE-5 SENYANGE |
|---|---|---|---|---|---|
| Conductivity µS/cm | 220 | 95 | 162 | 136 | 62 |
| pH | 6.87 | 6.73 | 6.81 | 6.70 | 6.30 |
| Temperature $^0$C | 23.6 | 22.5 | 23.4 | | 24.7 |
| Total Dissolved Salts mg/l | 112 | 48 | 80 | 64 | 32 |
| Turbidity NTU | 0 | 0 | 0 | 0 | 0 |
| Colour Pt units | 20 | 5 | 5 | 0 | 0 |
| Ammonium-N mg/l | 0.15 | 0.13 | 0.17 | 0.18 | 0.03 |
| Nitrite-N mg/l | 0.017 | 0.002 | 0.027 | 0.007 | 0.001 |
| O-Phosphate mg/l | 0.64 | 0.23 | 0.22 | 0.22 | 0.15 |
| Dissolved oxygen mg/l | 4,6 | 4.8 | 4.4 | 4.5 | 4.4 |
| Total coliforms CFU/100ml | 20 | 12 | 0 | 4 | 0 |
| E-coli CFU/100ml | 5 | 4 | 0 | 8 | 0 |

Besides the physical-chemical parameters of the commonly used water sources in Nyendo Ssenyange evidence indicates that water sources are prone to contamination including faecal contamination which is responsible for most of the water related health conditions at the household level within the study area. Most of the non piped water sources were of poor microbiology. Water samples collected from most of the selected unprotected water sources were contaminated with faecal matter (*E-coli)* as indicated in table above. This is largely attributed to poor sanitation facilities close to water sources, animal rearing and surface run off (refer to the social mapping). Given the increasing densification in the study area, coupled with poor housing development control and poor sanitation and increased conversion of wetlands for human activity, the quality of non piped water sources will increasingly deteriorate.